

Pittsburgh was equipped with a Weather Bureau thermoelectric pyrheliometer and an Engelhard recording microammeter near the end of December, 1929.

Table 1 shows that there were only a few days in January at Washington when the sky was sufficiently free from clouds to justify measurements of the intensity of direct solar radiation, and on these days the intensities on the whole were close to the average for January. At Madison measurements were obtained on an unusually large number of days, but the presence of smoke caused the intensities to average low. At Lincoln there were many clear days during the last decade of the month, with intensities only slightly below the average.

Measurements of the total solar radiation received on a horizontal surface summarized in Table 2, show a decided deficiency at Washington, New York, and La Jolla, close to the average at Madison, and an excess at the remaining stations for which average weekly values have been determined.

On account of a snow cover at Washington and Madison during most of the month skylight polarization measurements were not obtained.

TABLE 1.—Solar radiation intensities during January, 1930

(Gram-calories per minute per square centimeter of normal surface)

Washington, D. C.												
Date	Sun's zenith distance										Local mean solar time	
	8 a.m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°		Noon
	75th mer. time	Air mass										
		A. M.					P. M.					
		e.	5.0	4.0	3.0	2.0	1.0	2.0	3.0	4.0		5.0
	mm.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	mm.	
Jan. 4	2.87	---	---	1.13	1.27	---	---	0.98	0.76	---	2.16	
Jan. 6	3.63	0.84	0.98	1.16	1.27	---	---	---	---	---	4.37	
Jan. 9	10.21	---	---	---	1.15	---	---	---	---	---	01.59	
Jan. 25	1.78	---	0.75	1.07	1.28	---	1.20	---	---	---	2.36	
Means	---	(0.84)	(0.86)	1.12	1.24	---	(1.20)	(0.98)	(0.76)	---	---	
Departures	---	+0.11	+0.02	+0.11	+0.01	---	-0.03	-0.05	-0.11	---	---	

Madison, Wis.												
Jan. 2	2.74	0.80	0.91	1.04	---	---	---	---	---	---	---	3.99
Jan. 3	1.60	0.98	1.10	1.27	---	---	---	1.25	---	---	---	1.37
Jan. 7	0.91	0.79	0.97	1.11	---	---	---	1.09	---	---	---	0.96
Jan. 10	0.91	0.93	1.07	1.23	---	---	---	1.00	---	---	---	1.07
Jan. 16	1.07	---	---	---	---	---	---	1.18	---	---	---	0.91
Jan. 20	1.02	---	---	---	---	---	---	0.87	---	---	---	0.91
Jan. 21	0.51	---	0.73	1.03	---	---	---	---	---	---	---	0.58
Jan. 22	0.36	---	---	0.93	---	---	---	1.08	---	---	---	0.51
Jan. 23	0.43	---	0.61	0.90	---	---	---	---	---	---	---	0.86
Jan. 25	1.12	---	---	1.24	1.44	---	---	---	---	---	---	0.66
Jan. 28	0.96	---	0.74	1.14	1.42	---	---	1.29	---	---	---	1.52
Jan. 29	0.58	---	0.61	0.82	1.36	---	---	---	---	---	---	1.07
Means	---	0.88	0.84	1.07	1.41	---	---	1.11	---	---	---	---
Departures	---	-0.07	-0.21	-0.14	+0.05	---	---	-0.09	---	---	---	---

Lincoln, Nebr.												
Jan. 3	2.16	---	---	---	---	---	---	1.15	1.02	0.89	---	3.15
Jan. 4	2.49	1.01	1.12	1.24	1.37	---	---	1.10	0.84	---	---	2.49
Jan. 21	0.46	0.95	1.07	1.22	1.43	---	---	---	---	---	---	0.66
Jan. 22	0.46	---	1.04	1.23	1.42	---	---	1.25	1.11	0.97	---	1.07
Jan. 23	0.74	0.56	0.78	0.97	1.33	---	---	---	---	---	---	1.60
Jan. 24	1.45	---	---	---	---	---	---	1.20	1.07	1.00	---	1.96
Jan. 25	1.24	---	1.08	1.17	---	---	---	---	---	---	---	1.52
Jan. 28	1.24	---	---	1.18	1.40	---	---	1.39	1.19	1.07	0.94	1.52
Jan. 29	1.32	0.86	0.91	1.08	1.29	---	---	---	---	---	---	2.62
Means	---	0.84	1.00	1.16	1.37	---	---	(1.39)	1.18	1.02	0.95	---
Departures	---	-0.09	-0.05	-0.02	-0.01	---	---	-0.03	+0.01	-0.03	+0.03	---

† Extrapolated.

TABLE 2.—Total solar radiation (direct-diffuse) received on a horizontal surface

(Gram-calories per square centimeter)

Week beginning	Average daily totals								
	Washington	Madison	Lincoln	Chicago	New York	Pittsburgh	Gainesville	Twin Falls	Fresno
1930	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.
Jan. 1	158	122	185	112	128	106	302	205	185
Jan. 8	90	95	145	47	49	48	250	243	168
Jan. 15	123	187	234	162	75	103	172	295	166
Jan. 22	165	227	272	229	144	126	296	281	216
Jan. 1	+6	-14	+1	+30	+18			+29	+39
Jan. 8	-63	-50	-44	-35	-56			+60	+15
Jan. 15	-34	+25	+33	+65	-40			+104	-18
Jan. 22	-15	+38	+50	+117	+1			+101	-10
Departures from weekly normals									
Accumulated departure on Jan. 28	-742	-7	+280	+708	-539			+2,058	+104
									-1,148

POSITIONS AND AREAS OF SUN SPOTS

[Communicated by Capt. C. S. Freeman, Superintendent U. S. Naval Observatory. Data furnished by Naval Observatory in cooperation with Harvard, Yerkes, Perkins, and Mount Wilson observatories. The differences of longitude are measured from central meridian, positive west. The north latitudes are plus. Areas are corrected for foreshortening and are expressed in millionths of sun's visible hemisphere. The total area, including spots and groups, is given for each day in the last column.]

Date	Eastern standard civil time	Heliographic			Area		Total area for each day
		Diff. long.	Longitude	Latitude	Spot	Group	
1930	h m	°	°	°			
Jan. 1 (Naval Observatory)	11 42	-85.0	47.3	-5.0		247	
		-73.0	59.3	+10.0	31		
		+12.5	144.8	+12.0		139	
		+62.5	194.8	+17.5		386	803
Jan. 2 (Naval Observatory)	13 21	-78.0	42.3	-6.0		432	
		-73.0	45.3	+5.0	139		
		-59.0	59.3	+9.5	31		
		+27.0	145.3	+11.5		77	
		+78.5	196.8	+17.0	247		926
Jan. 3 (Naval Observatory)	11 8	-64.0	42.3	-6.0		309	
		-61.0	45.3	+5.0	123		
		-47.0	59.3	+9.5		31	
		-19.0	87.3	+5.0	3		
		+37.5	143.8	+12.0		62	528
Jan. 4 (Naval Observatory)	11 13	-49.5	43.6	-6.0		216	
		-46.5	46.6	+5.0	123		
		-33.0	60.1	+10.0	31		
		-15.5	77.6	-5.5	3		373
Jan. 5 (Naval Observatory)	11 16	-75.0	4.9	-8.5	77		
		-37.5	42.4	-5.0		340	
		-33.5	46.4	+5.5	123		
		-20.0	59.9	+10.0	31		571
Jan. 6 (Naval Observatory)	11 16	-76.5	350.2	+7.5	494		
		-76.0	350.7	-3.5	123		
		-61.5	5.2	-8.5	62		
		-24.5	42.2	-5.0		278	
		-19.5	47.2	+6.0	123		
		-6.5	60.2	+10.5	31		1,111
Jan. 7 (Naval Observatory)	14 4	-62.5	349.5	-3.0		154	
		-60.0	352.0	+7.0	478		
		-46.5	5.5	-8.5	31		
		-8.5	43.5	-5.0		231	
		-5.5	46.5	+5.5	123		
		+9.0	61.0	+10.0	31		1,048
Jan. 8 (Naval Observatory)	11 40	-53.5	346.7	-2.0		324	
		-48.5	351.7	+7.0	463		
		-36.0	4.2	-8.5		77	
		+3.5	43.7	-5.0		231	
		+7.0	47.2	+5.5	123		
		+21.5	61.7	+10.0	25		1,243
Jan. 9 (Naval Observatory)	11 12	-40.0	347.2	-2.0		401	
		-35.5	351.7	+7.0	432		
		-20.0	7.2	-8.0	31		
		+17.5	44.7	-5.0		154	
		+20.0	47.2	+5.0	108		
		+34.5	61.7	+10.5	25		1,151
Jan. 10 (Yerkes)	11 51	-66.0	307.8	+4.5	56		
		-39.0	344.8	-2.0		516	
		-22.5	351.3	-4.5	244		
		-21.5	352.3	+6.5	731		
		+33.5	47.3	+4.5	216		
		+36.5	50.3	-4.0		57	1,820

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard civil time	Heliographic			Area		Total area for each day
		Diff. long.	Longi-tude	Lat-i-tude	Spot	Group	
1930							
Jan. 14 (Perkins).....	h m	°	°	°			
	16 25	-48.2	270.0	+15.3		465	
		+30.1	348.3	-2.5	211		
		+32.4	350.6	-4.9	146		
		+33.5	351.7	+6.6	1,234		2,056
Jan. 15 (Perkins).....	13 19	-58.0	248.8	+13.7	93		
		-46.5	260.3	-14.6		183	
		-34.4	272.4	+14.8		1,048	
		-9.1	297.7	-12.9		93	
		+41.5	348.3	-3.0	546		
		+44.0	350.8	-5.3	217		
		+45.6	352.4	+6.4	1,203		3,383
Jan. 16 (Naval Observa-tory).	11 20	-80.5	214.5	+11.5	123		
		-56.0	239.0	-10.0	6		
		-46.0	249.0	+14.5		62	
		-31.5	263.5	-13.5		77	
		-22.5	272.5	+15.0		772	
		+0.5	295.5	-12.5		22	
		+25.0	320.0	-17.0		15	
		+41.5	336.5	+18.0		62	
		+44.0	339.0	+11.0		77	
		+55.0	350.0	-3.0		417	
		+58.0	353.0	+6.5	386		2,019
Jan. 17 (Naval Observa-tory).	11 31	-77.0	204.7	+14.5		154	
		-68.5	213.2	+10.5	93		
		-42.0	239.7	-10.5	6		
		-32.0	249.7	+14.0	46		
		-19.5	262.2	-13.5		77	
		-8.5	273.2	+14.5		694	
		+14.0	295.7	-12.0		40	
		+40.5	322.2	-15.5		46	
		+68.5	350.2	-2.5		324	
		+71.0	352.7	+6.5	370		1,850
Jan. 18 (Mount Wilson)...	12 35	-73.0	195.0	+16.0	63		
		-60.0	208.0	+14.0		19	
		-52.0	216.0	+10.0	58		
		-25.0	243.0	-11.0	2		
		-20.0	248.0	+13.0		23	
		-5.0	263.0	-15.0		21	
		+5.0	273.0	+13.0		458	
		+28.0	296.0	-13.0		2	
		+55.0	323.0	-18.0		18	
		+85.0	353.0	-4.0		249	
		+87.0	355.0	-5.0	52		
		+88.0	356.0	+6.0	73		1,038
Jan. 19 (Naval Observa-tory).	11 40	-51.0	204.3	+14.0		231	
		-6.5	248.8	+13.5	6		
		+6.5	261.8	-13.5		77	
		+19.5	274.8	+14.0		525	839
Jan. 20 (Naval Observa-tory).	11 20	-37.5	204.7	+14.0		201	
		+6.5	248.7	+13.5	6		
		+12.5	254.7	-15.5	15		
		+33.0	275.2	+14.0		525	
		+84.0	326.2	-14.0	62		809
Jan. 21 (Mount Wilson)...	13 15	-80.0	148.1	+12.0		142	
		-35.0	193.1	+15.0		87	
		-23.0	205.1	+14.0		10	
		-14.0	214.1	+10.0	4		
		+20.0	248.1	+13.0	15		
		+27.0	255.1	-15.0		3	
		+45.0	273.1	+13.0		221	482
Jan. 22 (Mount Wilson)...	12 30	-70.0	145.4	+12.0		408	
		-22.0	193.4	+15.0		42	
		-10.0	205.4	+14.0		15	
		-1.0	214.4	+11.0		1	
		+34.0	249.4	+14.0	4		
		+62.0	277.4	+13.0		63	533
Jan. 23 (Naval Observa-tory).	11 31	-54.0	148.7	+12.5		463	
		-3.5	199.2	+12.0		108	
		+74.0	276.7	+12.5		154	725

POSITIONS AND AREAS OF SUN SPOTS—Continued

Date	Eastern standard civil time	Heliographic			Area		Total area for each day
		Diff. long.	Longi-tude	Lat-i-tude	Spot	Group	
1930							
Jan. 24 (Naval Observa-tory).	h m	°	°	°			
	11 30	-41.5	148.1	+12.5		370	
		+6.0	195.6	+15.0		77	
		+48.5	238.1	-15.0		12	459
Jan. 25 (Naval Observa-tory).	11 33	-70.0	106.4	+17.0	31		
		-28.5	147.9	+12.0		293	
		+19.0	195.4	+15.0		62	386
Jan. 26 (Naval Observa-tory).	11 34	-43.5	119.7	+17.0	12		
		-14.5	148.7	+12.0		247	
		+32.5	195.7	+14.0		77	336
Jan. 27 (Yerkes).....	16 44	-29.0	118.3	+17.0	16		
		-26.0	121.3	+17.5	20		
		+1.5	148.8	+12.5		384	420
Jan. 28 (Naval Observa-tory).	14 3	-74.5	61.0	+7.0	123		
		-15.5	120.0	+16.5		46	
		+13.0	148.5	+12.0		185	354
Jan. 29 (Mount Wilson)...	13 35	-62.0	60.7	+8.0	101		
		-26.0	96.7	+7.0		11	
		-4.0	118.7	+17.0		69	
		+26.0	148.7	+11.0		37	
		+45.0	167.7	+4.0	5		223
Jan. 30 (Mount Wilson)...	13 45	-81.0	28.4	+21.0	189		
		-47.0	62.4	+7.0	72		
		-12.0	97.4	+7.0		9	
		+11.0	120.4	+17.0		147	
		+40.0	149.4	+11.0		99	
		+61.0	170.4	+5.0		28	544
Jan. 31 (Naval Observa-tory).	11 58	-61.5	35.7	+19.5		324	
		-34.5	62.7	+6.5	123		
		+21.5	118.7	+17.5		201	
		+53.0	150.2	+11.0		170	
		+73.0	170.2	+5.5		93	911
Mean daily area for Jan-uary							962

PROVISIONAL SUN-SPOT RELATIVE NUMBERS FOR JANUARY, 1930¹

[Data furnished through the courtesy of Prof. W. Brunner, University of Zurich, Switzerland]

January, 1930	Relative numbers	January, 1930	Relative numbers	January, 1930	Relative numbers
1	37	11	Ec 65	21	d 76
2	d 42	12	bbd 67	22	60
3	55	13	a 91	23	65
4	38	14	89	24	a 49
5	49	15		25	39
6	d 55	16		26	34
7	a 62	17	107	27	Eac 31
8	a 68	18	b 137	28	
9	62	19	97	29	62
10	57	20	63	30	d
				31	62

Mean, 27 days=63.7.

¹ Dependent alone on observations at Zurich and its station at Arosa.
a= Passage of an average-sized group through the central meridian.
b= Passage of a large group through the central meridian.
c= New formation of a large or average-sized center of activity: E, on the eastern part of the sun's disk; W, on the western part; M, in the central zone.
d= Entrance of a large or average-sized center of activity on the east limb.

AEROLOGICAL OBSERVATIONS

By RICHMOND T. ZOCH

Free-air temperatures were below normal at all stations except Due West, where they were above normal. (Table 1.) At most levels the negative departures at Ellendale, Broken Arrow, and Groesbeck were the greatest on record. This is significant in that the surface temperatures at Broken Arrow and Groesbeck show that these stations had the coldest Januarys on record, both stations establishing new absolute minimum temperatures. However, the mean temperature at Ellendale was slightly above the mean temperature of that

station for January, 1929. In marked contrast, Due West had the warmest January on record and established a new absolute maximum for that month.

Free-air relative humidities were above normal at all levels at Broken Arrow, Ellendale, and Royal Center but below normal at most levels at Groesbeck and Due West. Vapor pressures were below normal with very few exceptions.

The free-air conditions, i. e., temperature, relative humidity, vapor pressure, and resultant winds over